

## WHAT IS CLAIMED IS:

1. A slidably movable member used in contact with lubricating oil, comprising:
  - a substrate; and
  - 5 a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at%.
- 10 2. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is a diamond film formed by a chemical vapor deposition process.
3. A slidably movable member as claimed in Claim 1,  
15 wherein the surface section of said hard carbon-based film contains at least one of nitrogen and oxygen in an amount ranging from 4 to 20 at%.
4. A slidably movable member as claimed in Claim 1,  
20 wherein said hard carbon-based film has a surface roughness lower than 0.1  $\mu\text{m}$ .
5. A slidably movable member as claimed in Claim 1,  
25 wherein said hard carbon-based film has a hardness Hv higher than 1000.
6. A slidably movable member as claimed in Claim 1,  
wherein said hard carbon-based film has a thickness ranging from 1 to 10  $\mu\text{m}$ , wherein said hard carbon-based film has a coefficient of  
30 friction of not higher than 0.07 in a condition where said hard carbon-based film is dipped in a lubricating oil.

7. A slidably movable member as claimed in Claim 1, wherein said substrate is formed of a material selected from the group consisting of silicon nitride and steel.
- 5 8. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is formed of a material selected from the group consisting of diamond polycrystal, amorphous carbon, and diamond like carbon.
- 10 9. An adjusting shim used in a valve operating mechanism of an internal combustion engine, comprising:  
a substrate; and  
a hard carbon-based film coated on a surface of said  
15 substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at%.
- 20 10. A slidably movable member used in contact with lubricating oil, comprising  
a substrate; and  
a hard carbon-based film coated on a surface of said  
substrate, said hard carbon-based film having a surface section  
which contains hydrogen in an amount of not more than 10 at%.
- 25 11. A slidably movable member as claimed in Claim 1, wherein said hard carbon-based film is formed by one of a carbon ion beam process, a thermal chemical vapor deposition process, an ion plating process, and a sputtering process.
- 30 12. A slidably movable member used in contact with lubricating oil, comprising:  
a substrate; and

a hard carbon-based film coated on a surface of said substrate, said hard carbon-based film having a surface section which contains at least one of nitrogen in an amount ranging from 0.5 to 30 at%, oxygen in an amount ranging from 0.5 to 30 at%, and  
5 hydrogen in an amount of not more than 10 at%.

13. A method of producing a slidably movable member used in contact with lubricating oil, comprising:  
preparing a substrate;  
10 coating a hard carbon-based film on a surface of the substrate by a chemical vapor deposition process; and  
causing a surface section of the hard carbon-based film to contain at least one of nitrogen and oxygen in an amount ranging from 0.5 to 30 at% by one of a plasma treatment and an ion  
15 implantation process.
14. A method of producing a slidably movable member used in contact with lubricating oil, comprising:  
preparing a substrate; and  
20 coating a hard carbon-based film on a surface of the substrate by one of a carbon ion beam process, a thermal chemical vapor deposition process, an ion plating process, and a sputtering process, to cause a content of hydrogen in a surface section of the hard carbon-based film to fall within a range of not more than 10  
25 at%.